



Development of minimum competency assessment (AKM) numeracy test instruments containing ethnomathematics in elementary schools

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Article info	Abstract
Keywords numeracy, instrument test, ethnomathematics	Minimum Competency Assessment (AKM) is an evaluation tool used to determine the quality of a school through an educational report. This study aims to describe the process of developing ethnomathematics-loaded AKM test instruments and analyze their validity, practicality, and effectiveness. This study uses a development research approach using the ADDIE model, namely, (1) Analysis, (2) Design, (3) Development, (4) Implementation and (5) Evaluation. The research subjects involved 50 fifth-grade students at SDN Ujungnegoro 01 and SDN Wonokerso 02. The validation results from the validators showed a percentage of 95%, meeting the criteria of being very valid and suitable for testing, while the results of the validity of the items 30 out of 40 questions proved valid. The practicality test obtained an average score of 84% in the good category, and the practicality/readability response by the class teacher obtained a score of 93.06 in the excellent category. Based on peer assessment, the score was obtained with an interval of 91.67 in the excellent category. The effectiveness test is based on the questions' reliability, differentiating power, and difficulty level. The reliability test results from a Cronbach Alpha value of 0.874 indicate that the assessment instrument is highly reliable. The results of the differentiating power test were 14 questions in the sufficient category and 16 in the good category. Based on the results of the 30-question level test, there are eight questions in the easy category, 19 in the medium category, and three in the difficult category. The results showed that the developed numeracy AKM test instrument is valid, practical, and effective.

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1. Introduction

Education is the process of activities to gain knowledge or new insights (Gurning & Anggriani, 2024). Educational success begins at the primary level, where the teaching and learning process is key to achieving learning objectives (Anggriani, 2024). Education is an important foundation for developing the quality of human resources (Putri et al., 2023). The curriculum is one of the important things in the world of education. This is because the curriculum is a "path" from the beginning to the end of the learning program in a particular education (Suryaman, 2020). In 2022, the Minister of Education declared the Merdeka Belajar Curriculum to prepare Indonesia's golden generation and face the complexities of the 21st century (Hunaepi & Suharta, 2024).

Implementing assessment standards impacts the quality of education at the primary school level and helps create a strong foundation for future development within the education system. By applying the proper assessment standards, we can identify strengths and weaknesses in learning, provide constructive feedback to teachers and students, and measure progress in achieving learning outcomes (Navis & Kaltsum, 2021). Based on an analysis of several previous studies related to assessment in elementary schools, it turns out that assessment standards focus more on assessing learning outcomes (knowledge, skills, attitudes) acquired by students (Anggraeni et al., 2023).

In connection with the implementation of the Independent Curriculum in Indonesia, the Government has implemented an assessment replacing the *Ujian Nasional* (UN) with the *Asesmen Kompetensi Minimum* (AKM) since 2022 (Fauziah et al., 2022). The results of the AKM are used to determine school quality through education reports. This report is expected to be a reference for educational units and local governments to identify and improve the quality of Indonesian education (Shintia et al., 2024).

AKM is a basic competency assessment of reading literacy and numeracy skills (Sari et al., 2021). Reading literacy skills are the ability to understand, use, and evaluate various written texts and develop them to contribute productively to society. Numeracy is mathematical skills in understanding and using concepts, procedures, and mathematical facts to solve everyday problems (Novianti, 2021).

The needs of life in the industrial era 4.0 require every individual to have the skills to adapt to the development of the times. One of the skills that needs to be mastered is basic literacy (Cynthia & Sihotang, 2023). One type of basic literacy that needs to be mastered is numeracy literacy (Hadi & Sumardi, 2023).

Numeracy is the ability to think and solve everyday life problems in contexts that relate to individuals as citizens of Indonesia and the world, using concepts, facts, procedures, and tools in mathematics. Elementary school students are expected to be able to count and use numbers in problem-solving so they can have a strong foundation in learning and c

Based on the PISA (Programme for International Students Assessment) 2018, Indonesia is in the bottom 10 of 79 participating countries. The average reading ability of Indonesian students is 80, below the average. The ability of Indonesian students is also still below the achievement of students in ASEAN countries (Nur'aini, F., Ulumuddin, I., Sari, LS, 2021). Meanwhile, the results of PISA in 2023 revealed that Indonesia still ranks low, with a distance of 106 from the world average. There are 82% of students in Indonesia have numeracy skills below level two (Yuda & Rosmilawati, 2024).

This phenomenon also occurred at Ujungnegoro 01 Primary School, Batang Regency. Based on the 2023 SDN Ujungnegoro 01 Education Quality Report, the numeracy score was at 70%, which means that the numeracy score achieved by SDN Ujungnegoro 01 has not yet reached the good category. Students' numeracy achievement figures can be considered reasonable if they get the minimum numeracy ability, which is 90% (Aan Yunianto et al., 2024).

The questions contained in AKM are High Order Thinking Skills (HOTS) type questions, while students are accustomed to learning and giving questions of the Lower Order Thinking Skills (LOTS) type (Saraswati & Agustika, 2020). Students are not used to reading questions with long stimuli, and this is the beginning of students not understanding numeracy questions. On the other hand, students do not understand the meaning of the inaccurate questions. Students tend to rush to answer the questions, causing misunderstandings (Lubis et al., 2021).

Another cause is the lack of practice questions that can be used to practice AKM. Most of the questions made by teachers still contain LOTS and could not be accepted by students. Since teachers still could not understand the AKM framework and the context that must be met. In addition, this program is still relatively new, and sources containing AKM-based numeracy literacy questions are still tricky to find (Rokhim et al., 2021).

One of the things that can be used as a stimulus in AKM questions is things that are close to the world of students. Ethnomathematics can be used as a stimulus for questions to make it easier for students to understand them. Education and culture are a unity that applies in a society, and education is a basic need for every individual. Ethnomathematics is a knowledge that links mathematics with cultural elements (Fauzi et al., 2021).

PISA 2021 has used the mathematical framework in several contexts: personal, scientific, and cultural (Kurniawan et al., 2022). One of the things closest to the context of society is culture. The use of cultural context in its integration into mathematical problems is often known as ethnomathematics. In this case, ethnomathematics studies aim to understand a group's belief system, thoughts, and mathematical behavior, which can then be used as a basis for presenting meaningful mathematics learning for students (Nurhasanah & Puspitasari, 2022).

This research draws on typical cultures from Batang Regency, such as traditional food, regional dances, community social culture, and distinctive arts. The culture of Batang Regency is rich in traditions that reflect the local wisdom and spirituality of the community, such as *Kliwonan* and *Mitoni*, which are part of the ritual cycle of Javanese life as a form of respect for the phases of life and the universe (Furqon & Abidin, 2016). *Nyadran* is held in every Muharram as a form of Javanese and Islamic cultural acculturation to maintain harmony with ancestors and the environment (Trisnawati et al., 2024). *Minggong Jatinan* activity revitalizes the creative economy based on local wisdom by presenting traditional products and cultural performances in public spaces (Program et al., 2024). Not only that, traditional culinary delights such as *Serabi Kalibeluk* (a traditional pancake) also reflect the moral economy and culture of cooperation in the production and distribution processes (GustianYulius et al., 2023). All these cultural elements demonstrate the local richness and dynamics maintained and developed by the Batang community.

The ethnomathematics content can be placed on providing a stimulus for numeracy questions. It is hoped that the development of stimuli within local wisdom can be implemented with a constructivist approach that stimulates students with problems in the surrounding environment. Therefore, the design of the AKM numeracy test instrument containing ethnomathematics is expected to become a new concept and train students' critical thinking skills, which impact school education reports (Utari et al., 2024). Learning based on the environment helps students adjust to their surroundings (Ferazona et al., 2023).

The gap in the research and what happens in the field should happen. The main expectation of the Minimum Competency Assessment (AKM) for numeracy is to improve students' ability to think logically and solve numerical problems and ensure that all students have adequate basic competencies to participate in society actively. However, there are still shortcomings in implementing AKM Numeracy, starting from the school to students who are not ready. Several factors can influence students' low numeracy literacy ability. One of the factors influencing the students' low literacy skills is the lack of numeracy literacy exercises. Teachers tend to make closed

questions that can be solved using a formula. To overcome this problem, the teacher must plan a numeracy literacy culture program in learning mathematics so that students can face AKM well (Rohmah et al., 2022).

The above problems are in line with previous research according to Deviana and Aini (Deviana & Aini, 2022), who stated that AKM questions are a reference in the learning implementation process and AKM questions are arranged to make it easier to provide references to teachers in developing and compiling AKM questions, and also contain abilities to facilitate students to prepare AKM, which allows students to innovate and think critically. Meanwhile, previous Research from Zukhrufurrohmah & Putri (2021) stated that elementary school teachers prepare AKM by conducting workshops and mentoring to develop numeracy literacy instruments. The resulting product contains numeracy literacy questions at levels 1-3 by providing basic materials on numbers, algebra, geometry, and uncertainty data and providing positive things and motivation to teachers so that they can compile numeracy literacy questions. Although there has been previous research, this research has a novelty, namely, the test instrument is made based on ethnomathematics, which has many benefits, including being able to increase students' insight into the culture in their area, making it easier for students to understand questions because they are same likes their daily lives.

Based on the explanation above, the researcher is interested in researching the development of AKM test instruments that can meet the criteria for good tests to measure students' numeracy abilities by raising the title "Development of *Asesmen Kompetensi Minimum* (AKM) Numeracy Test Instruments Containing Ethnomathematics in Elementary Schools".

2. Method

This study used the research and development (R&D) type of research. According to Sugiyono (2019), the type of research used by researchers explains that research and development (R&D) is one of the research methods that tests the product's effectiveness to be produced (Okpatrioka, 2023). Educational research and development is used to develop and validate educational products. The advancement utilized in this investigation was the analysis, design, development, implementation, and evaluation (ADDIE) advancement created by Dick and Carey (Maxnun et al., 2024). Five stages in the ADDIE model are easy: conducting trials related to developing products and regularly compiling a series of systematic activities related to the needs of learning resources and student characteristics. The five stages of the ADDIE model include (1) Analysis, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation (Nova et al., 2022).

At the analysis stage (analyze), the researcher first conducted a needs analysis to discover the problems and understand how to develop the product. A needs analysis was conducted at SDN Ujungnegero 01 to determine the understanding of developing Minimum Competency Assessment (AKM) Numeracy questions for grade V students. Based on the student needs analysis questionnaire conducted through Google form, the results obtained in learning that have difficulty receiving material related to numbers, especially with long readings. Meanwhile, teachers play a little role in repeating difficult material. However, students still have difficulty understanding questions with long readings and more than one answer. Concerning pictures, students are greatly helped by colorful picture questions about things related to culture, habits, and customs in their residence. The role of schools is also still not maximized for AKM question practice, as evidenced by the unavailability of AKM question exercises. Therefore, the development of AKM test instruments that contain ethnomathematics content is further strengthened.

At the design stage, this research first went to the next stage, which identified the data that had been analyzed. In the next concrete step, the researcher began to design the product as a solution to the needs analysis that the researcher had done. The product designed as a solution to the needs

analysis was the creation of a Minimum Competency Assessment (AKM) Numeracy test instrument development for grade V elementary school students. The researcher designed a product with ethnomathematics content in Batang Regency.

The ethnomathematics content that follows issues circulating in the society consists of customs, regional culture, traditional food, local wisdom, and regional potential. The customs content includes *Kliwonan*, *Pasar Tiban*, *Mitoni*, *Nyadran* and *Sedekah Bumi*, *Minggon Jatinan*, and *Udik-Udikan*. Regional cultural content is *Babalu* Dance and Gamelan. Traditional foods were *Serabi Kalibeluk* and *Terasi Ujungnegoro*. Meanwhile, local wisdom and potential content are Sigandu Beach, *Becak Kerlip*, *Batik Gringsing*, Pagilaran Tea Garden, and Beach Safari Batang. All of these contents were used as a stimulus for the AKM questions.

At the development stage, the researcher first designs in a real (physical) form. Furthermore, according to product development, the researcher collected references that explained the Minimum Competency Assessment (AKM), Numeracy materials, practice questions, and image illustrations. In product development, the researcher paid attention to the attractiveness of the design, type of writing, color design, layout, and language design according to the characteristics of grade V students.

Researchers got validation results from the developed and tested products at the implementation stage. At the evaluation stage, researchers get results from two evaluations, namely formative evaluation and validation assessment results from teachers and lecturers, and then revise the validated product. Summative evaluation is in the form of completing the Minimum Competency Assessment (AKM) numeracy practice questions given by researchers to determine student learning outcomes from the influence of the product and filling out questionnaires of responses from students about the product's attractiveness.

The study subjects were fifth-grade students of SDN Ujungnegoro 01 and SDN Wonokerso 02. The instruments used were interview sheets, validation sheets, teacher and student practicality questionnaire sheets, and questions. Data collection techniques were observation, questionnaires, tests, and documentation. Data analysis techniques were qualitative and quantitative. Qualitative data explains information in written or oral form so that the data presented is not in the form of numbers. The study used qualitative data to find information based on interviews with cultural experts in Batang Regency and the results of the needs analysis questionnaire from grade V students. Qualitative data was obtained from product validation, which provided comments and suggestions from expert lecturers, grade V teachers, and student response questionnaires regarding product practicality related to readability. The results of the interviews and questionnaires became the researcher's guidelines for the developed product.

Quantitative data can be measured directly, and the explanation is stated using numbers. Data were used to explain clear phenomena and obtain measuring instruments. This researcher used quantitative data to obtain the results of the product validation questionnaire scores and student response questionnaires and the quality of each question item using validity, reliability, discrimination, and difficulty level tests.

The validity used in this case was content validity (experience validity). The content validity that was carried out in this study was the content validity given to the expert. Content validity shows that the instrument is prepared following the curriculum, materials, and expected learning objectives. (Aiken, 2025). The AKM numeracy test instrument contains ethnomathematics from student and teacher response questionnaire data. Effectiveness analysis used content validity tests, item validity tests, reliability tests, question difficulty level tests, and discrimination power tests.

3. Results

Results of the Validity Test of the AKM Numeracy Test Instrument Containing Ethnomathematics

The researcher's research and development produced an ethnomathematics-based numeracy AKM test instrument. The research on developing the ethnomathematics-based numeracy AKM test instrument product was conducted on SD Gugus Hasanuddin, Kandeman District, Batang Regency, grade V students, in the 2024/2025 academic year. Two schools were selected, namely Ujungnegoro 01 and Wonokerso 02 Elementary School. This research was conducted on 1 October -16 November 2024. The selection of SD Gugus Hasanuddin grade V students as the subjects of this research was due to several reasons. They were in the same geographical area, so the researcher assumed the same abilities. They have several research criteria, including the learning facilities or facilities available at SD Gugus Hasanuddin that support the mathematics learning process.

In addition, in this independent curriculum, teaching materials of the curriculum requirements must consider students' needs and socio-cultural backgrounds. Because of this, appropriate learning media need to be integrated with culture-based mathematics materials, but the development of ethnomathematics-based learning media is still minimal. Furthermore, the AKM results from SDN Gugus Hasanuddin are still below average; students cannot yet solve problems in questions based on higher-order thinking Skills. One of the components that causes this is the lack of students' ability to think creatively. There is research on developing an ethnomathematics-based numeracy AKM test instrument that follows curriculum requirements, paying attention to student needs and socio-cultural backgrounds.

This study uses the ADDIE model for research and development (R&D). The five stages of the ADDIE model are (1) Analyze, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation. The following is an explanation of the stages of research and development used by the researcher.

The validation used was construct validation (using experts) and item validation. Construct validation is carried out by researchers providing product validation instruments to expert validators. In this case, it would given to two expert assessment lecturers and two practitioners—the following results of expert validation. Based on the overall validator assessment, it can be seen that the AKM Numeracy Test Instrument Containing Ethnomathematics is included in the very high validation level because it obtained a score of 95%. Based on this, the AKM Numeracy Test Instrument Containing Ethnomathematics is suitable for use in research but needs to be revised.

Content validity research is used to demonstrate the quality of the content of the developed instrument. Therefore, content validity is essential in developing all types of instruments (Gul et al., 2022; Kalkbrenner, 2021). Furthermore, content validity is determined by validators who are experts in their fields and can make decisions in revising instrument content to obtain clarity and correctness (Noviana et al., 2023).

In addition to the validity test by experts, the validity test of AKM test items was also conducted. Data in empirical validation were obtained from the results of student trials of 50 students. The score of the test participants' answers was 0, 1, 2, and 3 according to each question. In the empirical validity analysis stage, the researcher used the Biserial correlation formula using IBM SPSS Statistics 16. The biserial point correlation is also used to determine the relationship between a question's answer score and learners' answer patterns (Zein et al., 2013). Determining the discriminating power value of questions and the validity of items has the same systematic, namely, biserial point correlation. It shows a relationship between item validity and discriminating power (Nurhalimah et al., 2022).

Empirical validity analysis was conducted to determine whether the test items in the developed test were valid or not. Test items were declared valid if $r_{\text{count}} \geq r_{\text{table}}$, whereas if $r_{\text{count}} < r_{\text{table}}$, then the question items were invalid. The following are the results of the analysis and interpretation of

empirical validation data assisted by IBM SPSS Statistics 16. Based on the validity test using SPSS 16, 30 valid questions were obtained. These results indicate that the AKM numeracy test instrument containing ethnomathematics for grade V elementary schools is valid.

Practicality Test Results of the AKM Numeracy Test Instrument Containing Ethnomathematics

The teacher practicality questionnaire is an instrument given to teachers and colleagues to determine the readability/practicality of the developed ethnomathematics-based AKM numeracy test instrument. The teacher and colleague practicality questionnaire uses a practicality instrument for practitioners, as shown in the appendix. The instrument covers several aspects, including visuals, text, language, and content. The results of the practicality test of teachers and peers can be seen in **Table 1**.

Table 1. Teacher practicality questionnaire results table

No.	Indicator	Respondents	
		Classroom teacher	Peers
1	Visualization	18	18
2	Text	12	10
3	Language	9	10
4	Contents	28	28
Total		67	66
Amount		133	
Maximum score		144	
Presentation of practicality		92%	
Category		Very practical	

AKM test instrument, which was developed based on the data in the table above, can be seen that according to the practicality/readability response by the class teacher, it obtained a score of 93.06 with an excellent category. Based on peer assessment, a score of 91.67 was obtained, which is very good. So, it can be concluded that according to practitioners (class teachers and colleagues), the developed AKM Numeracy test instrument is practical.

The student practicality questionnaire is an instrument aimed at students to assess the development of teaching materials based on a contextual approach. The instrument covers aspects including 1) visualization, 2) question instructions, 3) words or sentences in the question, 4) question content or material, and 5) language.

When the practicality test was conducted by distributing AKM Numeracy questions, students were enthusiastic at the beginning of working on the questions. The test instrument was presented with supporting images and attractive color choices. It made students interested in reading it. Students liked the design of the AKM Numeracy questions, but some children did not like the design. Students liked the size of the AKM questions because the writing and images were clear, not too small or too big, so they were easy to carry.

In the AKM Numeracy questions, instructions were given for the work, but some children did not understand the instructions. Accompanied by pictures, it helps students understand the questions, but some children do not understand the questions well. Graphs and tables accompany the presentation of questions to help students understand the material. Students felt more interested in working on it because the questions presented were related to the culture of Batang Regency. Many students have difficulty understanding the words they have just heard. The following table shows the results of students' practicality regarding the practicality of the AKM Numeracy test instrument containing ethnomathematics. The result of practicality can be seen in **Table 2**.



Table 2. Student practicality test results table

No.	Indicator	Respondents
1	Visualization	191
2	Question Instructions	65
3	Words or Sentences in Questions	259
4	Content of Questions or Material	324
5	Language	258
Total		1032
Maximum score		1224
Practicality Presentation		84%
Category		Practical

Based on the average score of the practicality/readability test in the data in the table, it can be concluded that the AKM Numeracy test instrument, containing ethnomathematics that is developing, was declared practical by students by obtaining an average score of 84.62, which is in the very practical category. Several questions have double stimuli, meaning that students are required to think analytically according to the stimuli. In addition, the mathematical concepts of discounting and comparison present a new challenge. The example question can be seen in **Figure 1**.

Kliwonan

Pada saat malam Jumat Kliwon, masyarakat Batang terbiasa melakukan tradisi Kliwonan di mana di alun-alun Batang akan dijual berbagai kebutuhan rumah tangga dan lainnya. Pak Doni akan menjual berbagai kebutuhan rumah tangga di Kliwonan. Pak Doni tahu bahwa masyarakat Batang yang datang ke Kliwonan pasti berburu harga yang lebih murah dari pada di supermarket. Ia menggunakan cara dengan memberikan harga spesial bagi pembeli yang akan membeli produknya lebih dari satu. Harga untuk satu pasang sepatu yaitu Rp 200.000,00 dan harga satu buah handuk adalah Rp 100.000,00. Berikut harga spesial yang diberikan oleh Pak Doni

Sepatu	Handuk
	
Beli 2 pasang Diskon 10%	Beli 2 Diskon 5%
Beli 3 pasang Diskon 20%	Beli 3 Diskon 15%

1. Pada saat itu, ada beberapa pembeli yang melakukan transaksi yaitu

- Pembeli A membeli 2 pasang sepatu dan 3 handuk
- Pembeli B membeli 3 pasang sepatu dan 2 handuk

Berdasarkan informasi di atas, pembeli yang mendapatkan total harga diskon dari pembelian produk lebih dari Rp 100.000,00 adalah ...

Jawab

2. Jika harga modal awal setiap barang adalah sepatu satu pasang Rp 150.000,00 dan handuk Rp 50.000,00, maka pernyataan yang benar adalah ...

- Jika ada yang membeli sepatu 3 pasang, maka Pak Doni rugi
- Jika ada yang membeli sepatu 3 pasang, maka Pak Doni mendapatkan untung Rp 20.000,00
- Jika ada yang membeli sepatu 3 pasang, maka Pak Doni mendapatkan untung Rp 30.000,00
- Jika ada yang membeli sepatu 3 pasang, maka Pak Doni mendapatkan untung Rp 40.000,00

Figure 1. Example challenge question

Results of the Effectiveness Test of the AKM Numeracy Test Instrument Containing Ethnomathematics

The effectiveness of the AKM Numeracy test instrument containing ethnomathematics is seen from the questions' validity, reliability, discriminatory power, and difficulty level. The instrument used is the AKM Numeracy test, which contains ethnomathematics and consists of 40 questions. If questions that have been composed do not meet the requirements, they were deleted so that the questions used only meet the criteria.

Reliability Test

Reliability data was obtained from the results of the AKM numeracy test containing ethnomathematics. This data is valid after being tested for validity by 50 students. In the reliability test analysis, the researcher used the KR-20 formula, assisted by IBM SPSS Statistics 16. An

instrument is declared reliable if it has a high level of reliability. The reliability in question is internal reliability, which is based on the results of matching between parts of the test results. The instrument can be reliable if $r_{11} > 0.4$ or at least in the medium reliability criteria. The following table shows the results of the reliability test analysis using the KR 20 formula assisted by IBM SPSS Statistics 16, which can be seen in **Table 4**.

Table 4. Reliability test results table

Reliability Statistics	
Cronbach's Alpha	N of Items
.874	30

An alpha coefficient of 0.70 or above is often regarded as acceptable in most social science research. However, very high values (e.g., >0.90) may suggest item redundancy and indicate that some items measure the same aspect of the construct (Tavakol & Dennick, 2011). The test developed by the researcher obtained a Cronbach Alpha value of 0.874, indicating that the assessment instrument has a high-reliability interpretation.

Discriminatory Power Test

Data on discriminatory power were obtained from the answer data of 50 students. The discriminatory power of questions is the ability to distinguish between students who are smart or have high abilities (upper group) and students who have low abilities or are less able (lower group). The number showing the discriminatory power is called the discrimination index (D). If the question is answered correctly by students with both high and low abilities, then the question does not have discriminatory power. Students were grouped into two groups, namely, the upper group and the lower group. Based on the discriminatory power test results, there were 14 questions in the sufficient category and 16 in the good category. Furthermore, the data of 30 questions were tested for the level of difficulty of the questions.

Test the Level of Difficulty of Questions

Data on the difficulty level were obtained from the answer data of 50 students. The difficulty level is one of the indexes that shows whether a test is difficult or not. Based on the test results on the difficulty level of the questions from the 30 questions, there were eight easy questions, 19 medium questions, and three difficult questions. According to (Arwinda Prasetyo, 2024), question balance means a proportional distribution between easy, medium, and challenging questions. The comparison between difficult questions was made 3-4-3, which means 30% easy category questions, 40% medium category questions, and 30% difficult category questions. Another similar alternative was 3-5-2, which means 30% easy category questions, 50% medium category questions, and 20% difficult category questions. It can be concluded that the AKM numeracy test questions are good test questions with proportional easy, medium, and challenging questions.

4. Discussion

Validity of the AKM Numeracy Test Instrument Containing Ethnomathematics for Grade V Elementary School

Valid can be interpreted as authentic, meaning that experts and practitioners have researched the teaching materials developed to be valid for use. The validity of teaching materials was obtained from the results of assessments by expert validators and practitioners. The practitioners selected

have the specifications of S2 graduates and have developed teaching materials. Indicators of the validity of teaching materials include relevance, accuracy, completeness of presentation, basic concepts of the material, and student-centered learning (Pujana et al., 2022).

The developmental research result is AKM Numeracy Test Instrument Containing Ethnomathematics for class V Elementary School" with class V mathematics material for semesters 1 and 2. In this research, the AKM numeracy test instrument containing ethnomathematics was validated. Developing an ethnomathematics-based AKM numeracy test instrument until it is valid using the ADDIE design started with analyzing, designing, developing, implementing, and evaluating. At the analyzing stage, the researcher analyzed the needs of teachers and students through a questionnaire on the needs of teachers and students. So, the AKM test instrument that was developed met the needs the needs of the field. As was done in the Research by Andi Rustandi and Rismayanti (2021), The first stage begins with conducting an analysis, namely field and literature studies. Field studies are conducted by interviewing directly with subject teachers. According to Hidayat et al. (2021), This analysis stage aims to identify possible causes of a learning Performance gap. Teachers must be able to determine the instruction that closes the gap, State's's the level that closes the gap, and offer strategies to close the gap in Performance based on empirical evidence of the potential for learning success. At the end of this stage, an evaluation activity is carried out to find weaknesses in this step and immediately make revisions as necessary (Subkhi Mahmasani, 2020).

The second stage is design. In this study, researchers designed AKM questions based on numeracy. Like the research conducted by (Latip, 2022), The analysis stage was carried out on the needs that have been collected previously, and then a design was made of the system that will be developed and the contents of each teaching media content. According to Firda et al. (2022), research conducted in developing Video learning media using the ADDIE model in English class IV subjects at the Karitas III Surabaya SDK has been carried out in sequential steps in obtaining product feasibility carried out by design experts, material experts, media experts, and peer assessments obtained product feasibility that was followed up on trials. The design stage is a systematic process that starts from setting learning objectives, designing teaching and learning activities, designing learning devices, designing learning materials, and learning outcome evaluation tools. This stage was carried out by determining students' sub-skills after following the learning process. In this design stage, educators, as instructional designers, are expected to be able to determine learning experiences (Nurhikmah et al., 2023).

The third stage is development. At this stage, the researcher designed it into a physical form. Things considered were the attractiveness of the design, type of writing, color design, layout, and design according to the characteristics of grade V students. The development stage includes several activities, namely developing instructional materials according to the syllabus, compiling materials according to the syllabus, evaluation (in the form of practice questions), and developing Chatbots needed by teachers (Adesfiana et al., 2022). The development stage in the ADDIE model contains the activity of realizing the product design. In the previous stage, the design that has been prepared is realized into a product that is ready to be implemented (Mulyasari et al., 2023).

The fourth stage is implementation. Researchers got validation results from the developed and tested products at this stage. The implementation stage was carried out in the small group and field trials. After designing the product, the implementation stage was the next step in developing learning media. Validation was carried out by media experts, material experts, and field practitioners (Vivien Pitriani et al., 2021).

The fifth stage is evaluation. Researchers got results from two evaluations, namely formative and summative evaluation. The development consists of stages that include the analysis stage, collecting information that can be used as material for making media products and design. This

stage was carried out to make it easier for researchers to design learning media applications that will be made (Anafi et al., 2021). Researchers carried out the evaluation stage by comparing the results of all trial stages and summarizing the results of the assessment of the feasibility of learning media by material experts, media experts, learning practitioners, and students (Vivien Pitriani et al., 2021).

Local culture is one of the components that gives us our identity as a special community among the world's nations. Local cultures in Indonesia are diverse. Therefore, we must maintain and preserve them. There are many ways to maintain and preserve local culture, including by integrating it into learning. Mathematics teaches cultural values by inviting students to connect their understanding and knowledge with daily life (Susanta et al., 2022). Based on the discussion of validity, it can be concluded that developing ethnomathematics-based AKM numeracy test instruments is valid and feasible.

Practicality of the AKM Numeracy Test Instrument with Ethnomathematics Content

Practical is easy and fun to wear (running, and so on). Van Den Akker stated: "Practically refers to the extent that users (or other experts) consider the intervention appealing and usable in normal conditions." According to Akker, the product's practicality level refers to the extent to which users or other experts consider the product attractive and valuable for teachers and students (Pujana et al., 2022).

This study used a teacher and student response questionnaire to determine the practicality of the AKM numeracy test instrument with Ethnomathematics content. Students filled out a practicality questionnaire consisting of 5 aspects: visualization aspects, question instructions, question words or sentences, question content or material, and language. The overall average practicality questionnaire from visualization, question instructions, question words or sentences, question content or material, and language was 89.62, which means that the AKM Numeracy test Instrument with Ethnomathematics Content was said to be practical. The results of the teacher's practicality questionnaire consisting of aspects visual, text, language, and material content by the class teacher scored 93.06 in the very good category, and rating peers obtained a score of 91.67, which is in the very good category.

Practicality tests can be used to observe the responses and obstacles faced by students when they read or try to solve problems related to the questions. According to Nia et al. (2020), positive responses from students indicate that the questions that have been designed are clear enough and easy to understand, which can be seen through the minimal improvements needed in the readability test.

An instrument is practical if Practitioners state that the product developed can be applied in the field and that product use is included in practical criteria. Practical criteria were guided by clarity in the AKM Numeracy test instrument containing ethnomathematics that have been developed, readability, ease of use, and benefits for teachers and students.

The AKM Numeracy test instrument containing ethnomathematics, which was developed, has advantages and disadvantages. The advantages were that: a) The AKM numeracy test instrument containing ethnomathematics trained students in understanding AKM Numeracy test questions, b) The AKM Numeracy Test Instrument Containing Ethnomathematics was used as a measurement tool for students' numeracy, c) The AKM Numeracy test instrument containing ethnomathematics was used as a measurement tool for students' mathematics assessment. d) The AKM Numeracy test instrument containing ethnomathematics was integrated science. e) The questions were made using the ethnomathematics of Batang Regency so that students can understand them because they are related to everyday life, and f) Increase cultural insight into Batang Regency. The limitations of the AKM Numeracy test instrument containing ethnomathematics were that a) it takes a long time

to teach students, and b) The AKM Numeracy test instrument containing ethnomathematics that was developed was only following the student needs questionnaire in the research subject.

Effectiveness of AKM Numeracy Test Instrument Containing Ethnomathematics

Effective means causing consequences, continuing, succeeding, and valid. Etzioni argues that effectiveness can be interpreted as success in achieving goals. Van Den Akker stated: "Effectivity refers to the extent that the experiences and outcomes with the intervention are consistent with the intended aims." According to Akker, effectiveness refers to the extent to which the experiences and outcomes are consistent with the intended aims (Pujana et al., 2022).

The AKM Numeracy test instrument contains prepared ethnomathematics. The questions were tested on the test subjects. Then, the questions were analyzed based on validity, reliability, discriminatory power, and difficulty level.

Validity.

Based on the test of the validity test, it can be concluded that out of 40 AKM numeracy questions based on ethnomathematics, 30 questions are valid. According to Anas Sudijono (2020), one of the characteristics of a good learning outcome test is its validity. A learning outcome test with high validity can be reliable, and there is no need to doubt its accuracy in measuring student learning outcomes. Wainer and Braun also argue that a good test must have validity characteristics to provide accurate information about the conditions of students taking the test.

The accuracy of the AKM Numeracy test instrument containing ethnomathematics developed in this study has guaranteed its validity. The validity of the developed test instrument was proven by expert assessment. Based on an expert assessment regarding the validity of the Bloom Taxonomy level, it is stated that the developed instrument follows the revised Bloom Taxonomy level.

Based on the expert assessment using the validation sheet, the average total validity was 95%. The instrument was very valid compared to the average total validity criteria table. Because the instrument developed is valid, the instrument can be used for the next stage.

Reliability

Reliability is the degree of consistency in measuring a set of questions. The reliability of the questions on this test instrument uses a split-half method. Based on the reliability index calculation, the result is 0.874 or rounded to 0.87. Compared with the reliability index interpretation table, the instrument developed has a very high-reliability index of 0.87. It is concluded that the reliability index of the instrument was in the very high category or that the instrument was stable when used to measure students' abilities.

According to Putri & Khusna (2020), Cronbach's alpha value with a sufficient category indicates that the question items are appropriate to the student's responses. Although the consistency of the student's answers (person reliability) is weak compared to good instrument quality (item reliability), the instrument can be considered reliable.

Previous research conducted by Siregar et al. (2023) developed a numeracy instrument with a work context. The difference between this study and the study by Siregar et al. (2023) is that in that study, the instrument developed was in the form of multiple-choice questions and descriptions with a work context. In addition, that study was conducted at the junior high school level, while in this study, the questions were only in the form of descriptions.

Distinguishing Power

The discriminatory power of questions is the ability of the question items to distinguish between intelligent and less thoughtful students. The instrument developed has two main criteria based on

analyzing the discriminatory power of questions. After the discriminatory power analysis, the follow-up was that questions with good discriminatory power were kept, and questions with low discriminatory power were kept. There are two possibilities for not continuing, namely: (1) traced to then be improved and then reused in the following learning outcome test to find out whether the discriminatory power has increased or not or (2) discarded. Items whose discrimination index numbers are negative should be discarded because the quality of the questions is very poor.

The factor that causes bad test items is that students find it challenging to answer the questions, so they have difficulty answering them. The benefits of the discriminatory power of test items are to improve the quality of test items based on the test item power index, whether good, revised, or rejected. In addition, it is also used to distinguish whether students understand or do not understand the material that the educator has delivered.

With the discriminating power, it is known between students who already understand the material that has been taught and students who do not understand the material (Kurniasi et al., 2020). The discriminating power scores are classified based on the quality of the questions, namely very good, good, bad, and very bad. It is done to make it easier to determine the quality of the questions that have been made according to the results of the calculations. This discriminatory power differentiates students who can do the ethnomathematics-based AKM numeracy test well from those who are less good.

Difficulty Level

The written test instrument was arranged according to the AKM question format: multiple choice, matching, complex multiple choice, essay, and short answer. The AKM numeracy test format with ethnomathematics content consisted of level C1 questions, level C2 questions, and level C3 questions.

A question's difficulty level is the chance of answering a question correctly at a certain ability level. From the analysis of the question's difficulty level, an average difficulty index was obtained in the range of 0.3-0.7. According to Djemari Mardapi Mardapi, good questions have a difficulty index range of 0.3-0.7. Questions with a difficulty level below 0.3 were considered too complex, and questions with a difficulty level above 0.7 were considered too easy. The criteria for the discrimination index of question items that may be used were ≥ 0.3 .

The results found that based on the difficulty level, the question items start from easy, medium, and difficult. Determining the difficulty level of the questions is very important, especially in determining the proportion and criteria of easy, medium, and challenging questions. The quality or otherwise of the learning outcome test items can first be known from each item's degree or difficulty level. The learning outcome test items can be stated as good items if the items are not too difficult or too easy. In other words, the degree of difficulty of the items is moderate or sufficient.

The test items are arranged starting from easy questions so that students do not panic when working on the questions. Calmness in answering the test affects students' ability to answer questions. The test participants' results will affect the difficulty level of the questions developed.

To ensure the accuracy of non-objective essay written test questions, the questions must meet the following requirements: (a) limit the scope by selecting essential material or lesson materials, (b) use good and correct language so that it is easy for students to understand, (c) do not repeat questions on the same material, (d) write a scoring rubric before writing the questions, (e) write the score for each question, (f) the formulation of the questions must be clear and firm, (g) the formulation of the questions must not use words that give rise to multiple interpretations, (h) have good question item parameter criteria, and (i) have high reliability.

Some factors that affect difficulty level analysis are that students do not understand the contents of the test instrument and students are not used to AKM numeracy questions that measure

high-level reasoning and thinking. Testing the difficulty level test has benefits for teachers and teaching. The second is to find out the emphasis of the curriculum and the meaning of the word to validate the advantages and disadvantages of the curriculum or analyze if there are questions that are not appropriate.

The results of the AKM numeracy test containing ethnomathematics were still relatively low due to several factors. First, learning in schools still used the lecture method, where instruction was teacher-centered, and learning media and assessment instruments had not yet been developed to align with the AKM numeracy test. Second, students were less trained in solving AKM numeracy test questions. It was because the sentences in the reading texts were too long. In fact, with numeracy, students can think, reason, and have the creative skills needed to keep up with developments in the digital era.

5. Conclusion and Implications

Conclusion

The following conclusions can be drawn based on the development research conducted. (1) AKM Numeracy test instrument containing ethnomathematicsThe developed AKM Numeracy Test Instrument with Ethnomathematics Content was proven to be valid with a very valid category according to experts and practitioners with a value of 95% with a very good category. (2) The AKM Numeracy Test Instrument with Ethnomathematics Content that was developed was proven to be practical with a very good category according to students with a value of 89.62 in the very good category, the class teacher obtained a score of 93.06with category and peer assessment obtained a score of 91.67 in the very good category. (3) The AKM Numeracy test instrument containing ethnomathematics was developed and was proven effective with validity, reliability, discriminatory power, and difficulty level of the questions. Of the 40 questions, there were 30 valid questions, with a reliability value of 0.874; discriminatory power contained 14 questions in the sufficient category, 16 questions in the good category, eight questions in the easy difficulty level, 19 questions in the medium category and three questions in the difficult category.

Implications

Based on the results and conclusions of the research, the theoretical and practical implications can be studied as follows. The theoretical implication is that the development research results can be used as a reference for similar research. Practical implications are as follows: (1) This research can be used as a reference to add new insights, increase creativity in developing an AKM numeracy test instrument containing ethnomathematics, and contribute to minimizing the problems in the world of education. (2) This Research can be used as a reference to improve numeracy and train students to try many ethnomathematics numeracy questions. (3) The learning process by utilizing the AKM numeracy test instrument can be a new reference so that the quality of education in the school can be improved.

However, this study still has some limitations, such as the limited sample size of only two schools in Batang Regency. Instrument testing can be conducted in schools with different cultural contexts as a follow-up. In addition, the cultural context can be added for various regions, not only in Batang Regency, so that this test instrument can make a greater contribution and be applied in various cultural contexts in Indonesia.

Credit authorship contribution statement

First Author: Development, Numeracy Test. **Second Authors:** Ethnomathematics. **Last Author:** Methodology, AKM.

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